amount of solar radiation received at the earth's surface was decreased by about 10 per cent. Observations of terrestrial radiation made at the same time by Mr. A. K. Ångström, showed that the presence of the dust likewise hindered terrestrial radiation, but not to such an extent as the solar radiation (of shorter wave-length). The net result of these opposite tendencies, however, seems to have been a decrease of heat available to warm the lower atmospheres. Temperature observations of high-level stations in Europe and America bear this out, showing a marked decrease of temperature with the beginning of the volcanic dust cloud at the end of June.

Other periods of marked decrease in the solar radiation received as observed during the last thirty years were the period 1883–1885 following the Krakatoa eruption; 1888–1894 after the great eruptions of Bandai-San, Mayon and other volcanoes; and the period 1902–1904 following the tremendous eruptions of Santa Maria and Colima.

In comparing Abbot's and Fowle's composite curve of Wolfer's sunspot numbers and Kimball's solar-radiation departures, with the mean departures of maximum temperature of 15 stations in the United States, it is interesting to note that the temperature effects of these dust-haze periods seem to explain the discrepancies in the apparent synchronism between terrestrial temperatures and the 11-year sun-spot period.

In an extra number of the *Bulletin of the Mount Weather Observatory*,[5] Professor W. J. Humphreys has discussed at length the subject "Volcanic Dust and Other Factors in the Production of Climatic Changes, and Their Possible Relation to Ice Ages." Particular attention is given to sun-spots and great volcanic eruptions as related to variations in temperature at the earth's surface since 1750. The phase of this subject concerning geological changes of climate is treated by the same author in the *Scientific American* Supplement, August 23, 1913, p. 114.

Charles F. Brooks
Blue Hill Meteorological Observatory

[5] Vol. VI., Part 1, 34 pp.

DEGREES CONFERRED BY THE UNIVERSITY OF BIRMINGHAM

At the Birmingham meeting of the British Association the university of the city conferred, as has already been noted here, the degree of doctor of laws on several of the foreign guests. In introducing them Sir Oliver Lodge, president of the association and principal of the university, spoke as follows:

Dr. Arrhenius: Director of the Nobel Institute for Physics and Chemistry, at Stockholm, fellow of the Swedish Academy of Sciences, and foreign member of our own Royal Society. The courageous way in which Dr. Arrhenius applied the theory of electrolytic dissociation to a quantitative study of chemical reactions has profoundly modified the trend of chemical science during the past thirty years, enlarging the scope of chemical investigation, harmonizing previously disconnected facts, and bringing an ever-increasing number of chemical phenomena within the range of quantitative and mathematical treatment. He is thus one of the most prominent of the founders of modern physical chemistry, the principles of which he has even applied, with singular success, to some of the most subtle phenomena of organic life. Recently his writings on cosmogony have aroused wide interest; terrestrial electricity and the aurora have yielded to him some of their secrets; and his speculations on worlds in the making are more than interesting and suggestive. A man of genius, and one of the founders of physical chemistry, I present for the honorary degree of doctor of laws, Svante August Arrhenius.

Madame Curie: The discoverer of radium, director of the Physical Laboratory at the Sorbonne, and member of the Imperial Academy of Sciences at Cracow. All the world knows how Madame Curie (coming from Warsaw as Marie Sklodowska to work in Paris), inspired by the spontaneous radioactivity newly discovered by Becquerel, began in 1896 a metrical examination of the radioactivity of minerals of all kinds; and how, when a uranium residue showed a value larger than could have been expected from its uranium content, she, with exemplary skill and perseverance, worked down some tons of this

material (given her by the Austrian government on the instigation of Professor Suess), chemically dividing it and retaining always the more radio-active portion, until she obtained evidence first of a new element which she christened polonium, in memory of her own country, and then after months of labor succeeded in isolating a few grains of the other and more permanent substance now so famous—a substance which not only exhibits physical energy in a new form, but is likely to be of service to suffering humanity. Of the metallic base of this substance she determined the atomic weight, finding a place for it in Mendeléeff's series; and with the aid of her husband, whose lamentable death was so great a blow to science, she proceeded to discover many of its singular properties, some of them so extraordinary as to rivet the attention of the world. Subsequent workers engaged in the determination of numbers belonging to either of her special elements, radium and polonium, have sought her advice, and it has proved of the utmost value. I have now the honor of presenting for our honorary degree the greatest woman of science of all time, Marie Sklodowska Curie.

Professor Keibel: The professor of anatomy in the University of Freiburg is the leading authority on the development of man and the embryology of vertebrates. He originated the international standards used in estimating embryological data, and through his classical work on comparative development he has reformed anatomical teaching by the infusion of developmental ideas. His important contributions to anatomical knowledge and method are widely known and highly esteemed, but nowhere more heartily and cordially than in the anatomical department of this university. Held in affectionate esteem by his colleagues, and directing one of the largest schools of anatomy in Germany, this eminent embryologist has been invited to receive our honorary degree, and I present to you Franz Karl Julius Keibel.

Professor H. A. Lorentz: To the great school of mathematical physicists of the last and present centuries we in England have proudly contributed even more than our share; but we recognize in the professor of physics in the University of Leyden a contemporary worker worthy to rank with our greatest. Professor Lorentz has extended the work of Clerk Maxwell into the recently explored region of electrons, and has developed in the molecular direction the Maxwellian theory of electrodynamics. He is a chief authority on the behavior of material bodies moving through the ether of space, and he has adopted and reduced to order many of the progeny resulting from the fertile marriage of electricity and light. A specially interesting magneto-optic phenomenon, experimentally discovered by his countryman, Zeeman, of Amsterdam, received at his hands its brilliant and satisfying interpretation; an interpretation clinched by predictions of what, on the electric theory of radiation, ought additionally to be observed—predictions which were speedily verified. The Zeeman phenomenon thus interpreted not only gives information as to the intimate structure of various elemental atoms, but, in the hands of the great American astronomers, has shown that sun-spots are electric cyclones of high magnetic power, and is likely further to contribute to our knowledge of solar and stellar constitution. As a great authority on electron theory, and one whose name will forever be associated with the now nascent electrical theory of matter, I present to you the distinguished mathematical physicist, Hendrik Antoon Lorentz.

Professor R. W. Wood: The professor of experimental physics in the John Hopkins University of Baltimore is a prolific experimentalist, and one to whose researches in physical optics modern science is greatly indebted. By ingenious use of little-known properties of light, he has explored the structure of molecules, applying the principle of resonance to determine their natural electronic period of vibration. He has, in fact, discovered a new type of spectra in the fluorescent resonance of metallic vapors. What more he has done, in connection with the anomalous absorption of sodium vapor with specially designed diffraction gratings, and with the application of monochromatic photography to the geology of the moon, it were long to tell; among other

things, he anticipated and realized the attainment of regular reflection from a sufficiently dense absorbing vapor; while to the public in America he is known as the inventor of a practical method of thawing frozen pipes by an electric current. The idea of a gigantic telescope in the form of a sunk well, with a revolving pool of mercury at its base to constitute a truly parabolic mirror, may not be a new one, but Professor Wood has taken it out of the region of the chimerical and shown that it is possible, even if not practically useful. We in this country have reason to envy the splendid resources which the munificence of citizens in America, and of governments elsewhere, places at the disposal of scientific explorers, and we honor and admire the use which is being made of those resources in every branch of science. As one of the most brilliant experimental physicists of the world, I present for our honorary degree Robert Williams Wood.

THE NEW INTERNATIONAL DIAMOND CARAT OF 200 MILLIGRAMS

THE importance of having uniform weights, and the great practical disadvantages resulting from the international use of a perplexing variety of standards, have long made themselves felt in the diamond market. This subject has just been very fully treated in a paper read before the American Institute of Mining Engineers, at the New York meeting, February, 1913, and at the Butte meeting, August, 1913.[1]

Those unfamiliar with the system of weights employed by diamond-dealers can scarcely appreciate the confusion that has existed, and the necessity for complicated calculations thereby entailed. This state of things will be best illustrated by giving here the equivalents in milligrams and troy grains of the principal standard carats as used in various trade centers:

	Milligrams	Grains Troy
Turin	213.5	3.29480
Persia	209.5	2.23307
Venice	207.1	3.19603
Austro-Hungary	206.1	3.18060
France (old)	205.9	3.17752
France (later)	205.5	3.17135
France (modern)	205.0	3.16363
Portugal	205.8	3.17597
Frankfort and Hamburg	205.8	3.17597
Germany	205.5	3.17135
East Indies	205.5	3.17135
England and Brit. India	205.3	3.16826
Belgium (Antwerp)	205.3	3.16826
Russia	205.1	3.16517
Holland	205.1	3.16517
Turkey	200.5	3.09418
Spain	199.9	3.08492
Java and Borneo	196.9	3.03862
Florence	196.5	3.03245
Arabia	194.4	3.00004
Brazil	192.2	2.96610
Egypt	191.7	2.95838
Bologna	188.6	2.91054
Internat. Carat, year 1875	205.0	3.16363
New International Carat	200.0	3.08647

A glance over this table will serve to show the crying need for the establishment of a uniform and rational standard, and a preliminary step in this direction was taken by the Parisian jewelers in 1877, when they adopted a carat of exactly 205 milligrams. However, such a carat could never become an integral part of the metric system, and as early as 1893 the writer suggested in a paper read at Chicago before the International Congress of Weights and Measures, held in connection with the World's Columbian Exposition, that a carat of exactly 200 milligrams should be recognized as the standard carat weight. Many years, however, elapsed before there was any definite prospect that this idea would be realized. The fact that in the early part of 1905 the German imperial government refused to recognize the carat then used in Germany as a standard weight, when requested so to do by the German Federation of Jewelers, because such recognition would be a violation of the laws prescribing the exclusive use of the metric system, is said to have powerfully

[1] "The New International Metric Diamond Carat of 200 Milligrams (Adopted July 1, 1913, in the United States)," by George Frederick Kunz, New York, N. Y., author's edition, 21 pp. (pp. 1225–1245 of the *Trans. of the Soc. of Min. Eng.*).